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SECTION 10

WATER DISTRIBUTION SYSTEMS

10.1 GENERAL

This section sets forth the general requirements for design and installation of water distribution systems for potable water service.

10.2 DESIGN STANDARDS

10.21 Reference

Normal flow demands for design shall be calculated on the basis of full ultimate development as known, or projected. The average daily flow for domestic use shall be calculated at the minimum rate of 300 gallons per day per equivalent residential unit, with 3.5 persons per single family residence, and 2.5 persons per multi-family or mobile home dwelling unit. Maximum day instantaneous demand to be used for design shall be 1.0 gallons per minute (GPM) per single family residence and 0.7 GPM per dwelling unit for each multi-family or mobile home unit. Flow demands for commercial, industrial or other special developments shall be established from existing records or by estimated projections, using the best available data. It shall be stated in the Developers Agreement that the Developer shall bear sole responsibility for sizing the water system improvements to meet the projected demand for the Development. Any future onsite upsizing of utilities required due to more intensive uses of the land shall be the responsibility of the Developer. Water main installations shall generally be in accordance with the Recommended Standards for Water Works, Latest Edition.

10.22 Water distribution systems and/or water main extensions shall be designed and constructed in accordance with the fire protection requirements of the Insurance Services Office (National Board of Fire Underwriters), as stated in their publication "Guide for the Determination of Required Fire Flows", if not in conflict with the following:

- A) Fire flows in single family residential areas shall provide a minimum of 500 GPM at a 20 psi residual pressure.
- B) Fire flows in commercial, institutional, industrial areas and apartment or multi-unit complexes, shall provide a minimum of 1500 GPM at a 20 psi residual pressure. Larger commercial/ industrial, major shopping centers, schools, and similar uses shall have a fire flow capacity of 2500 to 3500 GPM or as determined necessary by the Fire Department.
- C) Fire Hydrants

Distance from or spacing of fire hydrants shall be a minimum of 500 feet from the furthestmost point of any structure, as the Fire Department would lay hose or as otherwise specified by the Fire Department to meet determined water flow requirements for fire protection and/or increase fire protection effectiveness. Fire hydrants shall be connected to water mains of 6 inch minimum size which are of satisfactory loop design in low density residential subdivisions and a minimum of 8 inch mains in all other areas.

Connection to dead end stubs are acceptable, provided that said stubbed water main is not less than 8 inches and will provide acceptable flow.

D) System Size Computation

The minimum design for water distribution systems shall provide for at least 100% of the combined maximum day-demand rate and required fire flow for said rate, with special provisions for peak flows in excess thereof. The allowable minimum service pressure under said design condition shall not be less than 20 pounds per square inch. Design computation shall be by the "Hardy Cross" procedure, or other applicable methods, as dictated by the system configuration.

Design flows and method of computation shall be subject to review and approval by the City.

E) Valve Locations

Valves shall be provided for all branch connections, loop ends, fire hydrant stubs, or other locations, as required to provide an operable, easily maintained, and repaired water distribution system. A valve shall be required on each leg of every tee and cross. Valves are to be placed so that the maximum allowable length of water main required to be shutdown for repair work shall be 500 feet, for water mains 12" diameter or less. Valves are to be placed so that the maximum allowable length of water main required to be shut down for repair work shall be 250 feet, for water mains larger than 12" in diameter.

- A) Valve boxes falling in asphalt areas shall have compaction in 12" lifts, with the top 12" consisting of limerock, followed by a 24" x 24" x 6", 3,000 psi concrete collar.

10.23 Pipe Separation

All water mains shall be installed in accordance with Chapter 62-555.314, F.A.C., and in conformance with all separation requirements as found therein.

10.3 STANDARD REQUIREMENTS

10.31 General

The materials of construction and general installation procedures, with the exception of fire hydrants, shall comply with the specific applicable standards set forth under Section 2, "Utility Excavation, Trenching and Backfilling", Section 3, "Boring and Jacking", and Section 4, "Pipe, Fittings, Valves and Appurtenances", as well as "Standard Details-Water Distribution Systems".

10.32 Fire Hydrants

Hydrants shall comply with AWWA Standard C502, "Fire Hydrants for Ordinary Water Works Service", and shall be equipped with a minimum of one (1) pumper outlet nozzle 4 ½ inches in diameter and two (2) hose nozzles 2 ½ inches in diameter. Threads, nozzle caps, operating nuts and color shall conform to City Standards. Units shall be traffic type with breakable safety clips or flange, and stem with safety coupling located below barrel break line to preclude valve opening.

Hydrants shall be dry top type. Outlet nozzles shall be on the same plane, with minimum distance of 18 inches from center of nozzles to ground line. Valve shall be compression type with 5 1/4 inches minimum opening unless otherwise requested and show inlet connection to be 6 inches minimum.

- A) Hydrants shall be installed plumb and in true alignment with the connection pipes to the water main. They shall be securely restrained. The gravel or crushed stone for the drain sump, followed by backfilling, shall be carefully placed and compacted. Installed hydrants shall be painted red for the final coat.
- B) Hydrant placement is to be a minimum of 6 foot and a maximum of 9 foot from the curb or paved road surface unless otherwise approved. The center of the steamer port shall be 18 inches minimum and 24 inches maximum above final grade. Steamer port shall be correctly positioned for the proper connection, with the approval of the City (Water & Fire Department).
- C) All fire hydrants shall be equipped with a GradLock fitting for adjustment of the hydrant elevation.

10.33 Joint Restraining

“Mega-Lug” restrained joints shall be provided at all points where the line bends greater than 10 degrees and at all wyes, tees, caps, valves, hydrants and reducers. If any joints are within the required restrained length they shall be restrained with a restraining harness as required. The restraints will be sized and placed according to the plans or according to the pipe manufacturer’s recommendations when not shown on the plans.

10.34 Pipe Depth and Protection

The standard minimum cover for water distribution systems shall be 3 feet from the top of the finish grade. However, should this design not be feasible, protective concrete slabs shall be provided over the pipe within the limits of the lesser cover. Where waterways, canals, ditches or other cuts are crossed, ductile iron pipe shall be installed across and to 10 feet each side of the bottom. Additionally, approved utility crossing signs shall be placed on the pipe alignment at each side of the canal, etc. Plans for subaqueous crossings shall be subject to approval by the City and the City Engineer.

10.35 Connections at Structure

Where pipes are to extend into or through structures, flexible joints are to be provided at the wall face.

10.36 Special Exterior Protection for Corrosion

Extra protection shall be provided for underground ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement, through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be installed parallel to and within 10 feet of, protection shall also be provided. Steel pipe shall not be installed in severe corrosion areas.

10.37 Air Venting and Blow Offs

Where the watermain profile is such that an air pocket or entrapment could occur, resulting in flow blockage, methods for air release shall be provided. Air venting capabilities shall be provided for distribution mains by appropriately placing fire hydrants, blow-offs, or other manual devices. At critical points on major mains, automatic air release assemblies shall be installed. Special care shall be taken to preclude any cross-connection possibility in the design of automatic air release valve application. All dead-end water mains, temporary or permanent, shall be equipped with a lockable, manually operated blow-off at the terminus.

10.38 Service Connections

Connections to water mains 4 inches and larger shall be made by drilling the appropriate size hole and installation of service saddles, with services to smaller sizes accomplished by in-line fittings. A fitting with the service line extended to the property line or easement line, perpendicular to said line, and terminating with a plugged curb stop and meter box, pending meter installation. On curbed streets the exact location for each installed service shall be marked by etching or cutting a "W" in the concrete curb and painted blue. Where no curb exists or is planned, locations shall be adequately marked by a method approved by the City. Method: ½" steel rebar, 3" below final grade.

10.4 TESTING

- A) The contractor shall perform hydrostatic testing of all water distribution systems, as set forth in the following and shall conduct said tests in the presence of representatives from the City and/or other authorized agencies, with 48 hours advance notice provided, in writing.
- B) Piping and appurtenances to be tested shall be within sections between valves, not exceeding 500 feet unless alternate methods have received prior approval from the City. Testing shall not proceed restraining devices are installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.
- C) Hydrostatic testing shall be performed at 150 pounds per square inch pressure, unless otherwise approved by the City, for a period of not less than two (2) hours. Testing shall be in accordance with the applicable AWWA provisions for PVC-AWWA Publication M-23 and for DIP-AWWA Standard C600, Section 4. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formulas:

<u>PVC</u>	<u>DIP</u>
$L = \frac{ND P^{1/2}}{7400}$	$L = \frac{SDP^{1/2}}{133,200}$
For 150 psi; test:	L = 0.00165 ND (PVC)
For 150 psi; test:	L = 0.000092 SD (DIP)
L = allowable leakage in gallons per hour	

N= number of joints in section tested
S = length of pipe tested, in feet
D = nominal diameter of the pipe in inches

- D) The testing procedure shall include the continued application of the specified pressure to the test system, for the two hour period, by way of a pipe taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.
- E) Should the test fail, necessary repairs shall be accomplished by the contractor and the test repeated until within the established limits. The contractor shall furnish the necessary labor, water, pumps, gauges and all other items required to conduct the required water distribution system testing and perform necessary repairs.
- F) Pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150 psi for a duration of 2 hours by means of a pump.
- G) After the first initial test, if there is a failure, an additional fee of \$25.00 for every retest will be charged.

10.5 DISINFECTING

10.51 Following the pressure testing: the contractor shall disinfect all sections of the water distribution system, and receive approval thereof from the appropriate agencies, prior to placing in service. Advance notice shall be provided to the City before disinfecting procedures start. The disinfection shall be accomplished with the applicable provisions of AWWA Standard C651, "Disinfecting Water Mains" and all appropriate agency approvals. Computation of the amounts of chlorine to be used for disinfection should be approved by the City or its engineer consultant.

- A) Care shall be taken to provide disinfection to the total system and extremities shall be carefully flushed prior to chlorination.

After disinfection and final flushing have been accomplished, samples of water for bacteriological analysis shall be collected and submitted to and as directed by the Florida Department of Environmental Regulations or other appropriate approval agency.

Should these samples or subsequent samples prove to be unsatisfactory, then the piping shall be disinfected until a sufficient number of satisfactory samples are obtained.

- B) The contractor shall furnish all equipment and materials and perform the work necessary for the disinfecting procedures, including additional disinfection as required.

(Reserved)